# Developing a new teaching approach for the *Chemical Bonding* concept aligned with current scientific and pedagogical knowledge

**Tami Levy Nahum**

**Advisors: Avi Hofstein and Rachel Mamlok-Naaman**

Examining 14 years of high-school chemistry final examinations in Israel revealed that high-school students lack fundamental understanding regarding the topic *chemical bonding and structure*. The traditional pedagogical approach of curriculum developers regarding this topic, along with the final examination's demands foster certain instructions used by teachers who prepare their students for the examination. The combination of these factors generated a growing body of *pedagogical content knowledge (PCK)* with regard to this topic, which is overly simplistic and thus is not aligned with the up-to-date scientific knowledge. This PCK inevitably leads to superficial teaching and meaningless learning. In order to improve students' understanding of this topic, it was essential to propose a systemic treatment, namely, revising the scientific content, the pedagogical approach, and the assessment methods regarding this topic. Therefore, the main goal of this study was to build a conceptual framework that provides an advanced scientific and pedagogical foundation regarding the *chemical bonding* concept and that will guide chemistry curriculum developers as well.

In a collaborative process with lead-teachers, chemistry school educators and senior chemists, a conceptual framework for a new teaching approach was constructed. This process includes the formulation of *Learning Goals* aligned with current scientific knowledge. Moreover, we suggest that constructing assessment tasks on carefully specified *Learning Goals*, which are described in terms of *performances*, may enable us to foster and examine much deeper levels of students' understanding.